*Please make sure you have 16 pages and 14 questions*

## Q1. Growth and Development (7 Marks):

**Q1.Marks: /7**

**1A: Define Development: (0.5 mark)**

Development is defined as maturation of organs and systems, acquisition of new skills and functions as well as ability to adaptation and assuming responsibilities.

**1B: Define Failure To Thrive? (0.5 mark)**

Failure to thrive is a physical sign, not a final diagnosis .It is suspected when growth pattern by using growth charts, is below the third percentile for age, sex and race or crosses more than two major percentiles in a s short time frame.

**1C: Write down the post-natal stages of human growth and development: (2 marks)**

| Name of the stage | Duration |
|---|---|
| 1. Neonatal period | First 4 weeks after birth. |
| 2. Infancy: | 1-24 months. |
| 3. Childhood: | 2-12 years. |
| a. Early childhood | 2-6 years. |
| b. Late childhood (School age) | 6-12 years. |
| 4. Adolescence | *12-18 years* |

**1D: Fill the following table regarding assessment of developmental milestones by age :( 4 marks)**

| Age (Months) | Gross Motor | Fine Motor |
|---|---|---|
| 3 | Supports head when held erect<br>Supports weight on forearm and raises his chest when in prone position | Opens hands spontaneously |
| 6 | Sits momentary, supported by his arms<br>Sits alone, back straight (7 months) | Transfers objects from hand to hand |
| 9 | Creeps or Crawls | Pincer grasp (uses thumb & fingers to grasp objects) |
| 12 | Walks supported (with one hand held)<br>(Walks alone at 13 – 15 months) | Releases on object on command |

| Degree of weight loss | Edema | No Edema |
|---|---|---|
| <40% | Kwashiorkor | Under weight |
| >40% | Marasmic-Kwashiorkor | Marasmus |

**2B: Enumerate THREE absolute contraindications of breast feeding secondary to diseases related to the infant? (1.5 marks).**

1. Phenylketonurea
2. Galactosemia
3. Lactase deficiency

**2C: Mention the SEVEN steps for successful breast feeding: (3.5 marks)**

1. Inform all pregnant women about benefits and management of breastfeeding.
2. Help and encourage the mother to initiate breastfeeding half an hour after delivery.
3. Show the mother the correct technique of breastfeeding.
4. Give the infant no food or drink except milk in first 4-6m (Exclusive breastfeeding) unless medically indicated.
5. Practice rooming – in.
6. Encourage feeding on demands.
7. Avoid giving artificial teats or pacifiers to breast fed infant.

**2D: Mention three biochemical tests that support the diagnosis of early or subclinical protein energy malnutrition :(3 marks)**

1-Low serum albumin: 2.5 - 2.68 g/dL.
2-Non essential amino acids /essential amino acids between 2-3 (normal= <2).
3-Urea nitrogen/creatinine nitrogen ratio between 8-12.

**2E: Describe the TWO symptoms and TWO clinical signs that are suggestive of EARLY vitamin D deficiency rickets :(4 marks)**

- **Symptoms:**
  1. Irritability by day and insomnia by night
  2. Excessive sweating over the head
- **Signs:**
  1. Craniotabes: abnormal softening of skull bone .it is detected by pressing filmy over the posterior parietal bones. A ring [illegible]

progressively tachypnoic with expiratory grunting and [illegible]
(10marks)

**1. Mention two differential diagnoses? (3 marks)**

1. Respiratory distress syndrome
2. Congenital pneumonia.

**2. Enumerate THREE initial investigatory tools to arrive at the underlying etiological diagnosis? (3 marks)**

1. Plain CXR AP view
2. Complete blood count ,including TLC and differential
3. C reactive protein ,CRP
4. Pulse oximetry for SPO2 and Arterial blood gases for PO2 ,PCO2and pH

**3. Mention FOUR lines of treatment of the most likely diagnosis? (4 marks)**

1. Admission to NICU
2. Warmth and IV fluid
3. I.V. antibiotics
4. Start nasal O2 or CPAP according to severity of R.D.
5. Intubation and Mechanical ventilation if PO2<50mmHg,PCO2>60mmHg or pH<7.2
6. Surfactant administration through endotracheal tube.

**3B: Full Term baby four weeks old referred because of persistent jaundice with total serum bilirubin 17mg/dl and direct bilirubin is 1mg/dl .Mention FOUR causes that may be associated with this pattern of hyperbilirubinaemia. (4 marks)**

1. Prolonged physiologic jaundice due to persistent vomiting or constipation
2. Hypothyroidism
3. Breast milk jaundice
4. Criggler-Najjar syndrome

**3C: Define Small for gestational age, SGA infants (2 marks)**

Infants whose birth weight is below the 10th centile for gestational age

**3D: Enumerate FOUR maternal and FOUR fetal causes of small for gestational age infants**

| Item | Glomerular | Non- Glomerular |
|---|---|---|
| RBCs shape | Dysmorphic RBCs | Uniform size and shape |
| Proteinuria | present | absent |
| RBCs cast | Present | absent |
| Granular cast | Present | absent |

**6B: Mention TWO predisposing factors for increased susceptibility to infection in children with nephrotic syndrome: (1mark)**

1-Presence of edema

2-Low IgG levels due to urinary loss

3-Impaired T lymphocyte function

4-Concomitant Immunosuppressive therapy as steroid

5-Loss of factor B in urine (cofactor of C3b of the alternative pathway of complement which has an important role in opsonization of encapsulated bacteria as Streptococcus pneumoniae).

**6C: Mention TWO causes of normocomplementemic glomerulonephritis in children. (1mark)**

1. IGA nephropathy.

## Q5. Genetics and Dysmorphology(12 Marks):

| Q5.Marks: | /12 |
|---|---|

**5A: About Down syndrome (6 Marks):**

(A) Enumerate the TWO types of chromosomal abnormalities in Down syndrome? **(1 mark)**

1. Numerical (Trisomy 21)
2. Structural (Translocation)

(B) What is the expected FREQUENCY of the following problems in Down syndrome? **(1.5 marks)**

1. Congenital heart disease ( 50 %)
2. Polydactly ( Zero %)
3. Hypothyroidism ( 1-5 %)

(C) Mention FOUR complications in Down syndrome: **(2 marks)**

1. Recurrent chest infection.
2. Heart failure secondary to congenital heart disease
3. Accidents
4. Leukemia

(D) List THREE methods for prenatal diagnosis of Down syndrome in the first trimester: **(1.5 marks)**

1. Maternal biomarkers: - Pregnancy – associated plasma protein (PAPP-A)
   - Free Human chorionic gonadotrophine (HCG)
2. Fetal ultrasound for Nuchal translucency
3. Chorionic villous sampling for Karyotyping

**5B: Read the following scenario and Answer the following four questions: (6 marks)**

**(A male with Hemophilia A married a normal female)**

(A) The inheritance of hemophilia A is: X-Linked recessive **(1 mark)**

(B) -What is the chance for their future **SON** to be affected? (Zero %) **(1 mark)**

-What is the chance for their future **DAUGHTER** to be a carrier? (100 %)

## Q4. Preventive Pediatrics (5 Marks):

**Q4. Marks: /5**

**4A: Fill the following table of vaccination schedule for a 2 year-old child coming for immunization for the FIRST time.(2.5 marks)**

| Age | Type of Vaccine | | | | |
|---|---|---|---|---|---|
| 24 month | BCG | OPV-1 | DPT-1 | HepB-1 | MMR-1 |
| 25 month | ----- | OPV-2 | DPT-2 | ----- | ----- |
| 26 month | ----- | OPV-3 | DPT-3 | HepB-2 | ----- |
| 27 month | ----- | OPV-4 | DPT-4 | ----- | MMR-2 |
| 28 month | ----- | ----- | ----- | HepB-3 | ----- |

**4B: Mention FIVE Principles of Clinical Teratology? (2.5marks)**

**FIVE Principles of Clinical Teratology:**

1. There are no absolute teratogens.
2. Individual differences in susceptibility to teratogens exist.
3. Teratogens act at vulnerable periods of embryogenesis and fetal development.
4. Combinations of exposures to teratogenic agents may increase or decrease effects.
5. Teratogenic exposures tend to produce characteristic patterns of multiple anomalies rather than single defects.

## Q7. Cardiovascular System (12 Marks):

| Q7.Marks: | /12 |
|---|---|

**7A: Give reason: (6 marks, one mark for each question)**

**1-Why isolated large VSD is not a cause of heart failure in neonatal period? (1 mark)**

The normal postnatal delay in fall of pulmonary vascular resistance limits the magnitude of left to right shunt in the neonatal period and hence delayed the occurrence of symptoms of heart failure till the 4-6 weeks after birth.

**2-Why in rheumatic fever, chorea and arthritis seldom occur simultaneously while the combination of chorea and carditis may occur? (1 mark)**

Arthritis in RF occur a short latent period after streptococcal infection during the peak of Antistreptococcal antibodies .But in chorea and carditis , both the neurological symptoms and late onset carditis may occur after a relatively long latent period following streptococcal infection.

**3- Why in Hypercyanotic spell in tetralogy of Fallot patient, IV propranolol is recommended while captopril therapy is completely contraindicated? (1 mark)**

- IV propranolol increases the systemic vascular resistance and relax the RV infandibiulum , hence increases the pulmonary blood flow and improving hypoxemia.

- Captopril is a systemic vasodilator and so increases systemic flow at the expense of pulmonary blood flow and makes the patient more liable to more deterioration.

**4-Why a small patent ductus arteriosus, PDA in asymptomatic child should be closed? (1 mark)**

To prevent the risk of infective endocarditis.

**5-Why auscultation of pansystolic murmur but not ejection systolic murmur almost indicates an underlying structural heart disease? (1 mark)**

Ejection systolic murmur may be innocent secondary to flow in the outflow of normal semilunar valves or pathological secondary to narrowing at the same sites .But ,pansystolic murmur almost always indicate that the murmur occupying the isometric contraction phase of cardiac cycle ,and so pathological as in VSD,TR,MR

**6-Why an elevated or rising titer of ASO antibody is not an essential requirement for the diagnosis of the initial attack of rheumatic fever? (1 mark)**

Chorea and low grade / indolent carditis may occur late after a long latent period following streptococcal infection, so ASO titer may be negative.

**7B: Mention TWO clinical and TWO laboratory and or imaging findings suggestive of active rheumatic fever ? (4 marks)**

**Clinical : any two answers (2 marks)**

1. Joint symptoms , arthralgia or arthritis
2. New significant murmur or change of the character of already present murmur

- **Phase two**: Severe respiratory distress phase (average, 10 days): **(2 marks):**

    1. Symptoms of respiratory distress (tachypnea, nasal flaring, retractions, grunting)
    2. Cyanosis, indicating profound hypoxemia
    3. Episodes of restlessness or lethargy (may indicate hypoxemia and/or impending respiratory failure)
    4. Apnea may occur in infants, particularly in those born prematurely and those younger than 2 months of age

- **Phase three**: Recovery phase (may last 3 weeks). **(1 mark)**

**8D: list FOUR risk factors associated with severe bronchiolitis and/or complications (4 marks):**

Answer: Any FOUR of the following factors

1. Prematurity (gestational age <37 weeks)
2. Low birth weight
3. Age less than 6 to 12 weeks
4. Chronic pulmonary disease (bronchopulmonary dysplasia, cystic fibrosis, congenital anomaly)
5. Hemodynamically significant congenital heart disease (moderate to severe pulmonary hypertension, cyanotic heart disease, or congenital heart disease that requires medication to control heart failure)
6. Immunodeficiency
7. Neurologic disease
8. Congenital or anatomical defects of the airways

## Q13: Gastrointestinal diseases and Hepatology (6 Marks):

| Q13. Marks: | / 6 |
|---|---|

**13A: List SIX causes of metabolic liver diseases (3 mark)**

1. Alpha 1 anti trypsin deficiency
2. Gaucher disease
3. Neimann Pick disease
4. Wilson disease
5. Galactosemia
6. Glycogen storage disease

**13B: Write down the composition of WHO oral rehydration solution, ORS: (3 mark)**

1. Glucose: 111 mmol/l
2. Na: 90 mEq/L
3. K: 20 mEq/L
4. Cl: 80 mEq/L
5. Base(citrate): 30 mEq/L
6. Osmolaltiy: 311 mOsm/kg

**Laboratory /Imaging: any two answers (2 marks)**

1. Posistive acute phase reactants as positive CRP or elevated ESR
2. Incresaing cardiac size by CXR or progressive chamber enlargement by echo
3. Evolution of new valve regurgitation by echo

**7C: Define: (2 marks)**

**Innocent murmur: (1 mark)**

A murmur heard in the absence of structural abnormalities within the cardiovascular system or in the absence of abnormally hyperdynamic circulatory states

**Hypertension in asymptomatic child aged 6 year old: (1 mark)**

Answer: Elevated systolic and/or diastolic blood pressure above the 95$^{th}$ percentiles for age, sex.race and height on two or more occasions two or three weeks apart.

## Q8: Respiratory system (15 Marks):

| Q8. Marks: | /15 |
|---|---|

**8A: Regarding pneumonia in infants and children, mention SIX clinical manifestations that are indicative of severe infection? any six answers (3marks)**

Clinical criteria indicative of severe pneumonia ; any Six of the following criteria

1. Temperature >38.5°C
2. Respiratory rate >70 breaths per minute in infants (<12 months) and >50 breaths/min in older children
3. Moderate to severe retractions in infants and severe difficulty breathing in older children
4. Nasal flaring
5. Cyanosis or hypoxemia (oxygen saturation <92 percent)
6. Intermittent apnea in infants
7. Grunting respiration
8. Difficulty of feeding in infants and signs of dehydration in older children

**8B: Regarding pneumonia in infants and children, mention FOUR clinical and TWO radiological manifestations that are indicative of bacterial etiology?(4 marks)**

Four clinical criteria, any four of the followings criteria **(2 marks)**

1- The onset is abrupt with the high fever with the patient looking ill and sometimes toxic.

2- Respiratory distress is moderate to severe

3- Auscultatory findings are focal being limited to the involved anatomic segment.

4- Signs and symptoms of sepsis may be present particularly in young infants

5- Localized chest pain with or without parapneumonic effusion signifying pleural involvement

Two radiological criteria **(2 marks)**

1-The finding of radiological evidence of segmental or lobar consolidation .

Red pharynx, tonsillitis, palatal petechiae, white strawberry tongue then red strawberry tongue

**Exanthem: (2.5 marks)**

-Relation to fever: Rash appears 12 hours after fever, fever increases as rash appears

-Character: -Red pinpoint confluent, feeling like sandpaper (goose skin).

-Face: no rash, flushed cheeks with circum-oral pallor

-Spreading: Neck, axillae, groins in 1-2 days.

-Pastia's sign: accentuation of the rash at the lines of creases.

-Desquamation after 7 days, starts on trunk & spreads to limbs

**10E: Regarding Erythema infectiosum; Fifth disease, answer the following questions: (5 marks)**

**The Causative agent: parvovirus B19 (1 mark)**

**The characteristic features of the Exanthem: (2 marks)**

1. Relation to fever: Usually no fever
2. Character: At 1st like slapped cheek, then lace-like rash on extremities
3. Spreading: starting from the face for about 4 days then spreads in a lace-like pattern on extremities in the third to the seventh day with.
4. Rash recurs with warmth, exercise and emotional upset.

**Mention FOUR Complications of the disease :(0.5 mark) each**

1. Arthralgias or arthritis in adolescents and adults.
2. Thrombocytopenic purpura.
3. Hemophagocytic syndrome in immunocompromised patients.

| Parameter | Acute Bacterial meningitis | Viral meningoencepalitis |
|---|---|---|
| Protein | Usually 100-500 mg/dl | 50-200 mg/dl |
| Glucose | Decreased <40 mg/dl | Generally normal |
| Leukocytes | 100-10,000/cmm mainly polymorph | Rarely > 1000/cmm mainly lymphocytes |
| Gram stain | Usually positive | negative |

**10B: Rregarding Pertussis in children (6 marks)**

- **Clinically when you suspect? (2 marks)**

Cough for > 14 days with paroxysms, whoop or post- tussive vomiting in absence of fever, exanthem, sore throat, rales and tachypnea is highly suggestive of pertussis.

- **What are the investigations to confirm clinical suspicion of pertussis? (4 marks)**

-Leukocytosis with lymphocytosis.

-Chest radiography is mildly abnormal with perihilar infiltrate and occasional air leak.

-Direct fluorescence antibody test for nasopharyngeal secretions.

-Isolation of B. Pertussis in culture remains the gold standard for diagnosis.

**10C: Enumerate SIX diseases caused by Hemophilus influenza type b (6 marks):**

**Any six of the following**

1. Meningitis: accounted for half of invasive disease in prevaccine era.
2. Cellulitis especially in head and neck e.g orbital cellulitis.
3. Epiglottitis.
4. Pneumonia.
5. Suppurative arthritis usually affecting one of the large joints.
6. Bacteremia without focus usually manifests by high fever > 39 and leukocytosis.
7. Invasive disease of newborn in cases of premature rupture of membranes, chorioamnionitis in a

## Q9: Hematology and Oncology (8 Marks):

| Q9. Marks: | /8 |
|---|---|

**9A: A 4 month-old male infant presented with pallor and jaundice dating shortly after birth. He received 3 times blood transfusions over the last 3 months. His father had gall bladder stones for which cholecystectomy was done and his paternal grandfather had splenectomy done long time ago. The CBC shows Hb 8 gm/dL with MCV 80 fL, MCH 28 pg and MCHC 37. Answer the following questions: (4marks)**

a) What is the most probable diagnosis of such case? **(1mark)**

- Hereditary microspherocytosis

b) From the **above-mentioned data,** enumerate the 4 clues to support your diagnosis **(2marks)**

- Early onset of hemolytic anemia
- Normochromic normocytic anemia
- Increased MCHC
- Strong family history suggestive of autosomal dominant inheritance

c) What are the two additional laboratory tests needed to confirm the final diagnosis? **(1mark)**

- Peripheral blood film for the presence of spherocytes or increased reticulocytic count
- Increased osmotic fragility

**9B: A 2 year-old boy presented with acute purpura and ecchymosis with bleeding gums after few days of upper respiratory tract symptoms. His blood picture shows Hb of 11 gm/dL, white cell count of 6000/cmm and platelet count of 10000/ cmm with mean platelet volume of 11.No pallor, no Hepatosplenomegaly no lymhadenopathy. (4 marks)**

a) What is the most probable diagnosis of such case? **(1mark)**

- Acute idiopathic /immune thrombocytopenic purpura

b) Mention ONE short term and ANOTHER long term complications? **(1mark)**

- Intracranial hemorrhage in about 1%
- Chronicity in about one third

c) What is the next laboratory tool to arrive at the final diagnosis? **(0.5mark)**

- Bone marrow aspirate to demonstrate increased immature megakaryocytes

## Q12. Pediatric Emergencies (20 Marks):

**Q12. Marks: / 20**

**12A: Define Anion Gap and explain clinical significance (6 marks)**

A. Definition: **(0.5 mark)**

It is the difference between unmeasured anion and unmeasured cations

B. How to calculate anion gap: **(0.5 mark)**

AG = Na – (HCO3 + Cl-)

C. Explain clinical usefulness of anion gap: **(1.5 marks)**

In cases of metabolic acidosis it differentiates between bicarbonate loss and bicarbonate consumption. Normal anion gap means loss of bicarbonate and large anion gap means consumption of bicarbonate by added acids.

D. Mention THREE causes of high anion gap metabolic acidosis? **(1.5 marks)**

1-Lactic acidosis secondary to hypoxemia or low output state

2-Ketoacidosis secondary to starvation or DKA

3-Renal failure

4-Salicylate poisoning

E. Mention TWO causes of normal anion gap metabolic acidosis 1**(2 marks)**

1-Renal tubular acidosis

2-Diarrhea

**12B: Hyperkalemia (5 marks)**

A) Give THREE causes of hyperkalemia without increase in total body potassium? **(3 marks)**

- Metabolic acidosis
- Hemolysis
- Crush syndrome

B) What are the FOUR lines of treatment that do not alter total body potassium? **(2 marks)**

- Glucose – insulin infusion
- Salbutamol nebulizers
- Sodium bicarbonate infusion
- Intravenous calcium

**12C: Life support (6 marks)**

A) What are the anatomical factors that predispose pediatric airway for obstruction,mention three factors: **any three of the following (3 marks)**

- Large occiput and short neck causing head flexion
- Relatively Large tongue
- Easily compressible floor of the mouth

## Q14. Neurology (10 Marks):

**Q14. Marks: / 10**

**14A: Correct the underlined word or statement (5 marks)**

1. Dandy Walker malformation is a cause of primary craniostenosis.
   - Obstructive hydrocephalus
2. Diagnosis of cerebral palsy depends mainly on radiological finding.
   - Clinical findings
3. Breath holding spell is considered a type of simple partial seizure.
   - Condition mimicking epilepsy
4. Spinal muscle atrophy is an autosomal recessive disease affecting the peripheral nerve.
   - Anterior horn cells
5. Gillian Barre syndrome is best managed with the use of non steroidal anti-inflammatory drugs.
   - IV immunoglobulin

**14B: Flobby infant: (5 marks)**

- **Definition: (1mark)** Infant presenting with generalized hypotonia, usually due to an insult occurring during fetal or neonatal period.
- **Essentials for clinical diagnosis: (2 marks)**

1. Hypotonia presented as abnormal posture (frog like, rag doll), abnormal range of movements and decreased resistance to passive movement (positive scarf sign).
2. Delayed motor milestones.

- **Enumerate FOUR central causes of**

B) **Enumerate THREE circumstances in which there is absent or decreased effort of breathing in the setting of potential respiratory failure? (3 mark)**

- Exhaustion which is a preterminal sign
- Children with central nervous system depression
- Children who have neuromuscular diseas as spinal muscle atrophy or muscle dystrophy

**12D: Enumerate THREE causes of obstructive shock (3 marks)**

-Tension pneumothorax

-Cardiac tamponade

-Congenital heart disease with critical left outflow obstruction as HLHS or COA